Terminal Dam
Tacoma Vicinity
LaPlata County
Colorado
(Tacoma Project)

HAER No. CO-15

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, D.C. 20240

HISTORIC AMERICAN ENGINEERING RECORD

TERMINAL DAM
(Tacoma Project)
CO-15

DATE:	1903-1905
LOCATION:	Tacoma Vicinity La Plata County, Colorado
DESIGNED BY:	H. T. Henderson
OWNER:	no longer extant; demolished 1980
SIGNIFICANCE:	The Terminal Dam was an integral part of the Tacoma Project, an early hydroelectric development in southwest Colorado. The Project was constructed in the early 1900s to serve the needs of the mining operations in the Silverton district fifty mailes to the north. It was designed, and financing raised, by H T. Henderson, who hoped to reduce the cost of mining operations by making power available more cheaply.
HISTORIAN:	Colorado-Ute Electric Association, Inc.
EDITED AND TRANSMITTED BY:	Monica E. Hawley, Historian, 1980

Introduction

The Tacoma Project is a hydroelectric development located about 20 miles north of Durango, Colorado. It is owned and operated by Colorado-Ute Electric Association, Inc., Montrose, Colorado. The Project consists of a system of storage reservoirs, diversion dams and water conveyance conduits. The water supply for the Project comes from the Cascade, Little Cascade and Elbert Creek drainages. Water from Cascade Creek is transported to Electra Lake, storage reservoir for the Project, via a series of flumes, pipelines, canals and natural water courses (see Exhibit 1). Elbert Creek flows directly into Electra Lake. Water released from Electra Lake flows through a tunnel, a natural water course; and a flume to Forebay Lake, a regulation reservoir. Water from Forebay Lake is diverted into two riveted steel penstocks which transport it to the Tacoma Powerhouse with the tailrace discharging into the Animas River. The average static head between Forebay Lake and Tacoma Powerhouse is 948 feet and is used to generate 8,000 kW of power. Colorado-Ute plans to install 7,000 kW of additional generating capacity at the powerhouse in the near future.

The Tacoma Project is a part of the Tacoma-Ames Hydroelectric Project and is licensed by the Federal Energy Regulatory Commission (FERC). On December 12, 1978, Colorado-Ute filed an application for amendment of license, which amendment included in part: reconstruction of the Terminal Dam and removal of existing Terminal Dam, wholly or in part; reconstruction of Aspaas Dam and removal of existing Aspaas Dam, wholly or in part; construction of approximately 9,700 feet of 66-inch pipeline between Terminal Dam and Forebay Lake and removal of existing Power Flume No. 1.

Terminal and Aspaas Dams are timber-crib, rock-filled structures that have required extensive maintenance, and have deteriorated to a point that replacement is required. Power Flume No. 1 is being replaced due to high maintenance costs, short-life expectancy and a need for additional water carrying capacity. Terminal and Aspaas Dams and Power Flume No. 1 were determined to be eligible for listing on the National Register of Historic Places. Since these structures will be removed, it was determined by the Federal Energy Regulatory Commission and the Colorado State Historic Preservation Officer that documentation of these structures to National Architectural and Engineering Record Standards (NAER) would constitute adequate mitigation. This report has been prepared to document the project to NAER standards.

Historical Background

The Tacoma Project was constructed in the early 1900s to serve mining loads in the Silverton mining district, located approximately 50 miles north of the Project in the San Juan Mountains. Several mines in the Silverton area had been forced to close due to the high cost of steam power used in their mining operations. Coal had to be brought in by mule pack trains over extremely rugged terrain; and as a result, steam power costs were about $175.00 per horsepower per year. (1) A man named H. T. Henderson believed power could be supplied to the mines for $40.00 to $60.00 per horsepower per year by using locally generated hydroelectricity and transmission lines. (2)

H. T. Henderson, a civil engineer, had moved to the Durango, Colorado area from Tennessee around the turn of the century. Henderson studied the Ames hydroelectric facilities near Telluride, Colorado, northwest of Silverton, that had been developed by L. L. Nunn and witnessed how it had benefited mining operations in the Telluride District. He hoped to provide the same benefits for mines in the Silverton District. Henderson learned of the steep walled Animas River Canyon north of Durango and looked for a reservoir site to the west of the river on the plateau 1,000 feet above the Animas River where water could be stored and converted to power by gravity. (3)

Once Henderson located a suitable site, he organized investors in Tennessee and Indiana to finance the project. On November 10, 1902, H. T. Henderson, J. W. Adams and A. H. Mundee incorporated the Animas Canal, Reservoir, Water, Power and Investment Company for the purpose of building a hydroelectric power plant and supplying power to the mines in the Silverton District. (4)

Plans and specifications were drawn up and work began in the spring of 1903. Work on the Cascade Flume, Terminal Dam, and Power Flume No. 1 were started concurrently. Construction on all three structures was completed by the summer of 1905. During 1905, construction of the Tacoma Powerhouse on the west bank of the Animas River was initiated; the penstock between the Forebay Lake and Powerhouse was installed; and construction of a 44,000 volt transmission line between the Powerhouse and the substation at Silverton was initiated. (5)

The Animas Canal, Reservoir, Water, Power and Investment Company encountered financial difficulties and was reorganized and reincorporated as the Animas Power and Water Company in 1905. The Animas Power and Water Company took over the partially completed project and finished it, with the first power being produced and delivered in May of 1906. (6)

Documentation of Terminal Dam

Terminal Dam, the primary dam for the Electra Lake, the storage reservoir for the Tacoma Project, was probably designed by H. T. Henderson. A blueprint showing design features of the dam bears H. T. Henderson's signature (see Exhibit 2). Clearing of the reservoir site, located in a low-lying, swampy area on the plateau west of the Animas River, began in the spring of 1903 and construction of the dam was completed by the summer of 1905. Newspaper articles from this time period indicate the dam was constructed by local contractors.

Although no definitive records of the actual cost of construction were located, a November 23, 1903 cost estimate from the Office of the Chief Engineer, H. T. Henderson, estimated the total cost of construction of Terminal Dam would be $52,870.00. (7)

Terminal Dam, as it existed between 1906 and 1980, was a timber-crib, rock-filled dam. It was 730 feet long at the crest, had maximum width of 90 feet and maximum height of 90 feet (see Exhibit 2). The crest elevation was 8381 mean sea level. The timber cribs were ten feet square. The logs and rocks used for the original construction of the dam were obtained locally. (8) The original facing for the upstream face of the dam included one layer of two-inch boards covered by one layer of tar paper covered by two layers of one-inch boards. The original outlet works consisted of two 36-inch steel pipes with valves set in concrete that were buried underneath the dam (see Exhibit 2).

In 1907 the original outlet works were abandoned and a concrete intake tunnel, 7.5 feet wide by 6.5 feet high and 35 feet long, was constructed through the bedrock. Two 36-inch gate valves located side by side were installed in concrete at the end of the intake tunnel (see Exhibit 3). From the gate valves a discharge tunnel, 4.5 feet wide by 6.5 feet in height and approximately 155 feet long, was constructed through the bedrock.

In 1980 before it was dismantled, one 36-inch gate valve was located at the end of the 1907 intake tunnel (see Exhibit 4).

Discharge from the valve flowed through a 36-inch steel pipe, 105 feet long, located in an unlined rock tunnel that was constructed in 1928. Discharge from the pipe was regulated by a 24-inch motor operated pivot valve. A manually operated 24-inch gate valve was located immediately upstream from the pivot valve. Both valves were operated from a valve house located on the downstream side of the dam.

Terminal Dam has required maintenance repair numerous times since it was constructed in 1904. In 1925 decomposed logs in all cribs next to the upstream facing in the upper 15 feet of the dam and the upper 20 feet of the upstream facing were replaced. In 1935, additional repairs were made to the upstream facing. During the mid to late 1940s, the row of cribs next to the upstream facing was replaced with 10" x 10" timbers from the crest down to sound timbers and the corresponding upstream facing was replaced. During the 1950s and early 1960s several concrete seal pads were placed at the junction of the upsteam earthfill and the face boards to retard leakage into the lower portion of the dam. In 1966 metal sheet piling, 30 feet long, was driven to resistance of bedrock or fill along a portion of the face of the dam. At the same time, six vertical steel channel beams spaced on 20 feet centers were installed along the upper face of the dam with tiebacks through the dam. In 1976 the sheet piling was extended to cover the entire lower face of the dam. A horizontal steel beam was also installed in 1976 at elevation 8370 msl with tiebacks through the dam. Exhibit 5 shows repairs made to the dam between 1935 and 1973.

Footnotes

(1) Western Colorado Power Company, "Statement A - History of Origin and Development," from Reclassification of Electric Plant - Statements A to I Inclusive, 1944, p. 57.

(2) "Reclassification of Electric Plant," p. 57.

(3) "Reclassification of Electric Plant," p. 57-58.

(4) "Reclassification of Electric Plant," p. 58.

(5) "Reclassification of Electric Plant," p. 62-65.

(6) "Reclassification of Electric Plant," p. 62-65.

(7) From a document located in the Western Colorado Power Company Collection, Center of Southwest Studies, Fort Lewis College, Durango, Colorado..

(8) "Reclassification of Electric Plant," p. 61.